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Correspondence Between Retrospective and Momentary Ratings of Positive and Negative Affect in Old Age: Findings From a One-Year Measurement Burst Design

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Discussion. Our discussion focuses on the implications of affective memory biases for examining affective experiences as they occur in peoples' daily lives and points to implications concerning methods and theory development.

Key Words: Affect—Emotional memory bias—Intraindividual variability—Measurement burst—Old age—Well-being.

RECENT approaches to subjective well-being (SWB) advocate the use of experience-sampling and diary assessments that capture affect in real-time rather than only retrospectively in terms of a trait (Hoppmann & Riediger, 2009; Röcke, Li, & Smith, 2009). Importantly, past research points to discrepancies between momentary and retrospective ratings over short periods such as minutes or weeks in young adults. This study extends past research by examining the correspondence between older adults' current evaluations of SWB and their retrospective evaluations over one year.

Correspondence Between Retrospective and Momentary Affect in Young Adulthood

Retrospective assessments are often based on semantic knowledge about average past affect but are also influenced by the worst and final moments. In contrast, current affect ratings typically involve the retrieval of distinct and recent episodes (Fredrickson & Kahneman, 1993; Robinson & Clore, 2002). Retrospective and momentary affect ratings thus capture different components of a person's SWB, possibly leading to divergent reports.

Indeed, the average of momentary reports only moderately correlates with retrospective ratings across several domains (Carver & Scheier, 1994; Klumb & Baltes, 1999; Stone, Broderick, Shiffman, & Schwartz, 2004). For example, Hedges, Jandorf, and Stone (1985) compared four momentary reports with end-of-day ratings in middle-aged and older adults over fourteen days and found that individuals retrospectively overestimate positive affect (PA) and negative affect (NA; Parkinson, Briner, Reynolds, & Totterdell, 1995; Thomas & Diener, 1990).

Which features of well-being over time most strongly influence the summative memory for past well-being? Findings from young adults are mixed with some studies pointing to peak affect (Hedges et al., 1985) and others to average and recent affect (Fredrickson & Kahneman, 1993; Parkinson et al., 1995). In addition, valence differences have been reported. Thomas and Diener (1990) found correlations between actual and recalled affect intensity to be smaller for NA than for PA. Furthermore, Parkinson and colleagues (1995) report that peak momentary affect influenced retrospective daily affect ratings independently of average momentary affect for PA but not for NA.

Discordance Between Retrospective and Momentary Affect in Older Adults

Interestingly, most past research focuses on young or middle-aged adults and on short time periods from seconds to a few weeks. This study aimed to examine if the respective findings generalize to older adults. Several studies suggest close correspondences between current and recalled affect in older adults for the following reasons: Older adults may be less prone to time frame–related priming effects when rating emotional stimuli (Ready, Robinson, & Weinberger, 2006; see also Lachman, Röcke, Rosnick, & Ryff, 2008). In addition, age-related declines in episodic memory may make older adults less prone to the effects of single events on judgments of retrospective affect. There may also be valence differences in that older adults have a greater memory

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advantage for positive over negative information (Mather & Carstensen, 2005) and a reduced memory advantage for negative over neutral material than young adults (Grühn, Smith, & Baltes, 2005). Consistent with these findings Ready, Weinberger, and Jones (2007) found older adults to overestimate PA retrospectively more than younger adults, whereas the reverse was true for retrospective versus current NA.

The Present Study

We use affective experience-sampling data from five sampling periods across twelve months in combination with end-of-year retrospective ratings from very old adults to examine the correspondence between reports of momentary affect over time (i.e., average, peak, and recent) and retrospective recollection of affect. Based on evidence about older adults' decreased proneness to time frame–related priming effects and a greater correspondence between well-being reports across different time intervals, we expected a moderate to strong relative correspondence between retrospective and momentary PA and NA. In line with documented age differences in emotional memory, we hypothesized that older adults would be motivated to focus on salient past positive experiences resulting in retrospective affect being most strongly linked to peak PA over and above average momentary PA. In contrast, peak or recent NA was expected to be less related to retrospective NA than the average of the momentary NA.

Method

Participants and Procedure

Eighty-three adults (M = 80.62 years; 72–97 years) participated in an intensive measurement burst study (Nesselroade, 1991) after the third assessment occasion of the Berlin Aging Study (Baltes & Mayer, 1999). The sample was positively selected as compared with the overall Berlin Aging Study sample regarding cognition, vision, and hearing (+0.8–1.2 *SD*; Klumb & Baltes, 1999). We focused on 53 adults (M_{age} = 80.17 years, SD = 4.16, 72.80–91.54 years) who completed at least three of the five measurement bursts and the retrospective assessment (35.8% women; 41.5% married; 43.4% widowed; 90.6% living at home; moderate subjective health: range 1–5, M = 2.87, SD = 0.98) Drop-outs (n = 30) were slightly older than the 53 participants (M = 81.97 years, SD = 6.44 vs. M = 80.17 years, SD = 4.16; $t(81) = 1.55$, $p < 0.01$, but the two groups did not differ regarding gender, marital or residential status, and subjective health.

The study included five measurement bursts scheduled two months apart. Each burst consisted of six days of experience sampling, including random signals five times per day on a portable beeper to report one's current affect (ie, up to 30 possible assessments per burst). Daily beeps were at least 15 min apart (M = 150 min) and occurred during the average waking time. Individuals completed a mean of 4.77 bursts (SD = 0.51) and provided an average of 26.98 experience-sampling diaries (SD = 4.26) across bursts. At the end of the year, participants recalled their affect for the past twelve months.

Measures

Participants rated their *momentary* PA (happy, interested, active, relaxed) and NA (depressed, bored, lonely, irritable) on a scale from 0 (*not at all*) to 4 (*very much*). Momentary PA and NA scores were computed as the average across the respective items. *Average momentary affect* represents the mean of all momentary affect ratings across bursts. Two indicators of peak affect were *peak burst affect* (ie, highest average burst PA/NA compared with remaining bursts) and *peak daily affect* (ie, maximum daily PA/NA across bursts). Two indicators of recent affect were *recent burst affect* (ie, mean PA/NA in the last burst prior to the retrospective rating) and *recent peak day* (ie, peak daily PA/NA in the last burst).

Retrospective PA and NA was obtained at the end of the twelve-months study period with the same affect adjectives based on the question "How often did you experience each of the following emotions during the past year?" (0 = *never* to 6 = *almost always*). The response scale differed from the momentary assessment in range (1–4 vs. 1–6) and format (intensity vs. frequency), so we focus on relative rather than absolute associations between momentary and retrospective affect (see Supplementary Table A1 in the online Appendix for descriptives and zero-order correlations).

Results and Discussion

Intraindividual Variability and Change in PA and NA

We first examined intraindividual variability and change within and across bursts using multilevel modeling (Raudenbush & Bryk, 2002). Intraclass correlations from unconditional three-level models indicate that for PA, 34%, 19%, and 47% of the variance originated at the level of day, burst, and person, respectively. For NA, 50%, 20%, and 30% of the variance originated at the level of day, burst, and person, respectively. Tau coefficients and their respective standard errors for PA and NA as obtained using the program Hierarchical Linear Modeling (HLM) indicated that all variance components were highly significant: PA Level 1 = .169, SE = 0.18, $p < .001$; PA Level 2 τ = .427, SE = 0.091, $p < .001$; NA Level 1 τ = .042, SE = 0.005, $p < .001$; NA Level 2 τ = .064, SE = 0.014, $p < .001$.

We then examined trajectories of PA and NA in conditional three-level models (ie, day level, burst level, person level). At Level 1, affect for person j on day i was modeled as a function of the average affect across all days in a burst (β_{0jk}), the slope of day (β_{1jk}; ie, average day-to-day change), and a random effect (r_{ijk}): s_{ijk}(daily affect) = β_{0jk} + β_{1jk}(day in study) + r_{ijk}. At Level 2, affect for person j in burst k was modeled as a function of the average affect across bursts (γ_{00k}), the slope of burst (γ_{01k}; ie, average burst-to-burst change), and a random effect (u_{0jk}): β_{0jk} (burst affect) = γ_{00k}

Table 1. Results of Hierarchical Regression Analyses Showing Unique Predictive Effects (ΔR^2) of Different Momentary Affect Indicators for Individual Differences in Retrospective Affect

		Dependent variable			
		Retrospective PA		Retrospective NA	
Model	Predictors in model: different indices of momentary affect[a]	ΔR^2 for momentary PA predictors	ΔR^2 for momentary NA predictors	ΔR^2 for momentary NA predictors	ΔR^2 for momentary PA predictors
1	Average	**.09***	.00	**.01**	.15**
	Peak burst	**.00**	.04	**.02**	.04
2	Average	**.11****	.06#	**.01**	.03
	Peak day	**.01**	.00	**.02**	.02
3	Average	**.08***	.07*	**.03**	.02
	Recent burst	**.01**	.00	**.01**	.11
4	Average	**.12****	.07*	**.06***	.00
	Recent peak day	**.01**	.00	**.01**	.06*
5	Average	**.04#**	.00	**.00**	.00
	Peak burst	**.00**	.03	**.03**	.00
	Recent burst	**.01**	.00	**.02**	.07*
6	Average	**.06***	.03	**.01**	.01
	Peak day	**.01**	.00	**.03**	.03
	Recent peak day	**.01**	.00	**.01**	.07*
7	Average	**.04#**	.00	**.00**	.01
	Peak burst	**.01**	.05#	**.01**	.02
	Peak day	**.01**	.01	**.01**	.07*
	Recent burst	**.00**	.01	**.01**	.04
	Recent peak day	**.00**	.01	**.00**	.00

Notes: Within-affect domain associations are in bold. Across-domain associations are in normal font. Recent burst = mean affect score for the last burst an individual participated in. Recent peak day = peak daily affect score during the last burst an individual participated in. NA = negative affect; PA = positive affect.

[a]Numbers represent ΔR^2 due to adding a given variable after controlling for all other variables derived from separate hierarchical regression analyses.

#$p < .10$; *$p < .05$; **$p < .01$.

+ γ_{01k}(burst number) + u_{0jk}. At Level 3, we modeled between-person differences in the average daily and burst affect as well as in day-to-day and burst-to-burst affect change ($\gamma_{00k} = \delta_{000} + v_{00k}$; $\gamma_{01k} = \delta_{010} + v_{01k}$).

Participants reported high levels of PA ($b = 2.79$, $SE = 0.11$, $p < 0.01$) and low levels of NA ($b = 0.38$, $SE = 0.05$, $p < 0.01$; Supplementary Figure A1). Both PA ($b = -0.01$, $SE = 0.01$, n.s.) and NA ($b = -0.01$, $SE = 0.01$, $p < .01$) showed little change (decrease) from day-to-day within a burst. PA decreased slightly from burst to burst ($b = -0.12$, $SE = 0.02$, $p < 0.01$), likely reflecting reactivity and adaptation to the repeated assessments.

PA decreased slightly from burst to burst (b ; -0.12, SE = 0.02, p<0.01), likely reflecting reactivity and adaption to the repeated assessments. Given that Burst 1 PA was significantly higher than the momentary PA across the remaining bursts, we have rerun all analyses both with and without Burst 1 PA information. The pattern of findings was almost identical so that we only report results from the analyses including all available burst data. In contrast, individuals reported stable burst-to-burst NA ($b = -0.02$, $SE <$ 0.01, n.s.). There were significant interindividual differences in intercepts and slopes. Individuals thus experienced sizeable short-term (day-to-day) and long term (burst-to-burst) within-person variations in affect speaking to the plasticity of the affect system into late life (Röcke et al., 2009) but also little systematic change over twelve months, supporting the notion of maintenance of well-being in later life.

Correspondence Between Momentary and Retrospective Affect Ratings

Zero-order correlations.—Relative associations between retrospective and momentary affect ranged from $r = 0.49$ to .63 for valence-homogeneous comparisons (momentary vs. retrospective PA) and from $r = -0.29$ to $r = -0.53$ for valence-heterogeneous comparisons (eg, momentary PA vs. retrospective NA; Supplementary Table A1). Consistent with our hypothesis, all indicators of momentary PA and NA were moderately positively related to the retrospective scores in the valence-homogeneous comparisons, indicating that individuals reporting high retrospective affect also reported high momentary affect. The degree of this correspondence was comparable to studies using younger samples (Thomas & Diener, 1990; Wirtz, Kruger, Scollon, & Diener, 2003). Hence, older adults are fairly accurate in recalling their past affect.

Specific momentary affect characteristics.—In a next step, we examined which of the momentary affect indices best predicted retrospective reports beyond the other indices. The different indices were highly correlated within each affect domain, with correlation coefficients ranging from $r =$ 0.57 to .97 (Supplementary Table A1). We conducted seven multiple hierarchical regressions for each affect domain in which retrospective affect was the dependent variable and different momentary affect scores served as predictors,

varying their entry order to obtain R^2-change coefficients representing the unique predictive role of each index above the others (Table 1). The first four models compared average momentary affect with one of the four remaining indices of peak and recent affect. Models 5 and 6 included all three indices of momentary affect as predictors (average, peak, and recent), once using burst-level and once using day-level peak and recent affect indicators. In Model 7, all momentary affect indices were consecutively entered as predictors.

Overall, unique predictive effects ranged from 1% to 15% of individual difference variance accounted for. Results for *valence-homogeneous analyses* for PA indicated that *average* momentary affect across all momentary assessments was the strongest unique predictor. Neither peak nor recent momentary PA contributed a reliable unique proportion of explained variance. Overall, no individual momentary affect index stood out for within-domain correspondence of NA. The pattern of results was much less consistent for the *valence-heterogeneous analyses*. These findings are in contrast to our hypotheses that peak PA would be the strongest or at least a unique predictor for recalled PA and that average NA would have a prominent role in shaping individual differences in recalled NA in older adults. The observed differences may reflect differential recall strategies that operate within affect domains: Whereas individuals tend to aim at feeling good in general, making an averaging strategy a useful approach for estimates of past PA, it may be functional to remember specific negative episodes (both peak and recent) to try to avoid the various specific contexts that elicited these states in the future, leading to a lack of a single specific momentary predictor of retrospective NA. We note that in our small sample, variance in momentary NA was much lower (but significant) than in PA (.07 vs. .49) and NA was reported at very low levels consistent with the idea that older adults maximize the positive and minimize the negative. Hence, the different aspects of momentary NA may not have been suited to differentially relate to retrospective NA. Future studies may want to focus on a sample undergoing major life events expected to lead to stronger intraindividual and interindividual variation in NA in order to more closely examine the dynamics and subjective reconstruction of affect in times of challenge.

Age differences.—In a final step, we also explored differences in the correspondence between momentary and retrospective affect as a function of age in our older adult sample to examine whether some of the hypothesized effects would be particularly evident for the oldest old. We added the respective age interactions to the final step of Models 5 and 6 from Table 1 (after centering all predictor variables), which included all three major indicators of momentary affect (mean, peak, and recent) on a day level and a burst level, respectively (see Supplementary Tables A2 in the online Appendix for the complete results). The only significant age interaction emerged for the prediction of retrospective NA with peak day PA, indicating that for the oldest old adults, there was a particularly strong inverse relationship between peak day PA and retrospective evaluations of NA compared with the younger old adults.

Conclusion

Using data from 53 older adults who participated in five intensive measurement bursts across one year, we show that the affect system is remarkably robust until very old age. We replicate and extend previous findings from younger samples by showing that there is great relative correspondence between very old adults' recalled and momentary affect over time (average, peak, and recent). Despite postulated recall and forecasting biases in young adults (Wilson & Gilbert, 2005), very old adults fare quite well in recollecting their past affect. For PA, average rather than peak momentary affect best predicted recalled affect, whereas no individual momentary affect index uniquely predicted recalled NA. Future research should focus on the mechanisms and functional implications of individual differences in the degree of correspondence (Lachman et al., 2008) between retrospective and real-time ratings.

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Supplementary Material

Supplementary material can be found at: http://psychsocgerontology.oxfordjournals.org/

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